Ordering number: EN2119D

CMOS LSI

LC7461M

Infrared Remote Control Transmitter IC

Functions

- 32⊕3 function keys
- 13-bit custom codes
- Operating supply voltage range V_{DD} = 1.8 to 3.6 V
- Supply current at the standby mode I_{DD} = 1 µA or less
- Double-press operation keys (no priority given)
- On-chip oscillator (ceramic resonator : connected externally)

Features

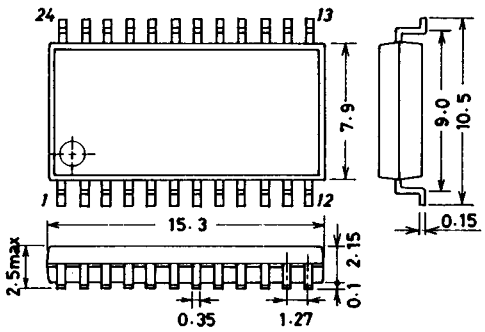
- The custom code consists of 7 bits to be fixed by the on-chip ROM and 6 bits being pin-settable. Sixty-four custom codes may be selected externally (no diode required).
- Minimum number of external parts required

Package Dimensions

unit : mm

3045B-MFP24

[LC7461M]



SANYO : MFP24

Specifications

Absolute Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V_{DD} max	V_{DD}	V_{SS}–0.3 to +5.5	V
Input voltage	V_{IN}	Each input pin	V_{SS}–0.3 to V_{DD}+0.3	V
Output voltage	V_{OUT}	Each output pin	V_{SS}–0.3 to V_{DD}+0.3	V
Output current	I_{OUT}	OUT	–35	mA
Allowable power dissipation	Pd max	Ta ≦ 85°C	150	mW
Operating temperature	Topr		–40 to +85	°C
Storage temperature	Tstg		–50 to +125	°C

Allowable Operating Conditions at Ta = 25°C

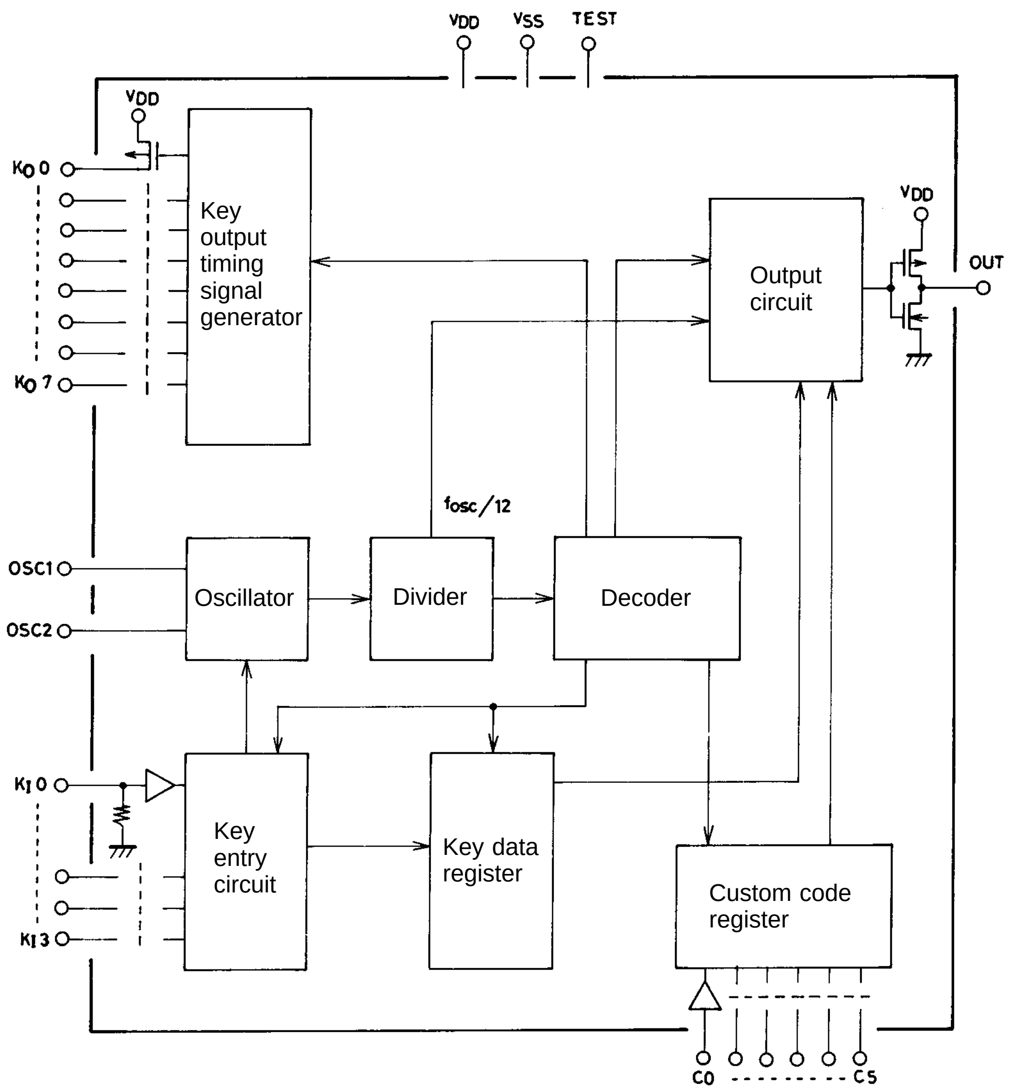
Parameter	Symbol	Pin Name	Conditions	min	typ	max	Unit
Supply voltage	V_{DD}	V_{DD}	f_{OSC} = 455 kHz	1.8	3.0	3.6	V
Input high-level voltage	V_{IH}	K_I0 to K_I3, C_0 to C_5		0.7 V_{DD}		V_{DD}	V
Input low-level voltage	V_{IL}	K_I0 to K_I3, C_0 to C_5		V_{SS}		0.3V_{DD}	V
Oscillation frequency	f_{OSC}			400	455	500	kHz

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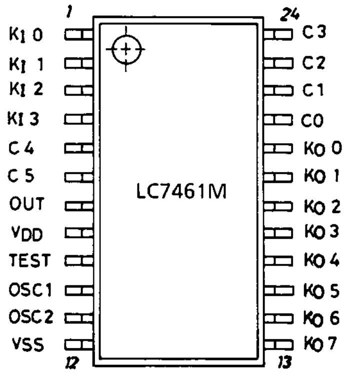
Electrical Characteristics at Ta = 25°C, V_{DD} = 3.0 V

Parameter	Symbol	Pin Name	Conditions	min	typ	max	Unit
Operating supply current	I_{DD}	V_{DD}	Key ON, output: no load			1	mA
Quiescent supply current	I_{DS}	V_{DD}	All keys OFF, OSC stop			1	µA
Output high-level current	$I_{OH}1$	OUT	V_{DD} = 1.8 V, V_{OH} = 1.0 V		–8		mA
	$I_{OH}2$	OUT	V_{DD} = 3.0 V, V_{OH} = 1.0 V		–25		mA
Output high-level voltage	V_{OH}	K_O0 to K_O7	I_{OH} = –0.1 mA			0.3	V
Output low-level voltage	V_{OL}	OUT	I_{OL} = 0.1 mA			0.3	V
Output OFF-state leakage current	I_{OFF}	K_O0 to K_O7				1	µA
Input high-level current	I_{IH}	C_0 to C_5	V_{IN} = V_{DD}			1	µA
Input low-level current	I_{IL}	C_0 to C_5	V_{IN} = V_{SS}	–1			µA
Input floating voltage	V_{IF}	K_I0 to K_I3				0.1 V_{DD}	V
Input pull down resistance	R_{IN}	K_I0 to K_I3		75	100	125	kΩ

Internal Block Diagram

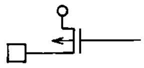
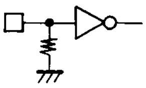
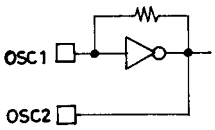
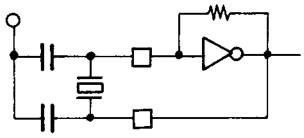
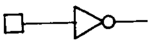
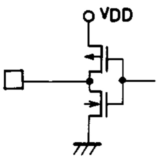


Pin Assignment



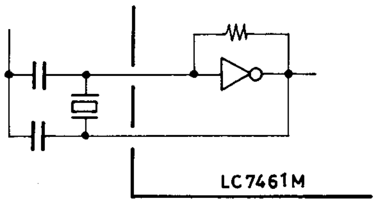
Top view

Pin Description

Pin Name	Pin No.	Input/Output	Internal Equivalent Circuit	Pin Function
V_{DD}, V_{SS}	8, 12			Power supply pins V_{SS} = GND
K_O0 to K_O7	13 to 20	Output		Key scan timing signal output pins
K_I0 to K_I3	1 to 4	Input		Keys return signal entry pins
OSC1 OSC2	10 11	Input/output		Input/output pins for ceramic resonator-used oscillation  Oscillator configuration
C_0 to C_5	21 to 24, 5, 6	Input		Input pins for custom code setting Capable of externally setting 6 bits of 13 bits in all that provide a custom code
OUT	7	Output		Output pin for transmit LED drive
TEST	9	Input		LSI test pin Normally set to high-level or brought to open state

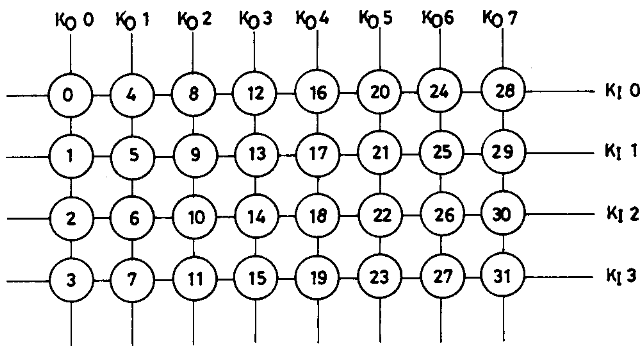
General Description of Function

1. Oscillator
   Since a self-bias type amplifier of CMOS inverter is contained, an oscillator can be formed by connecting a ceramic resonator.



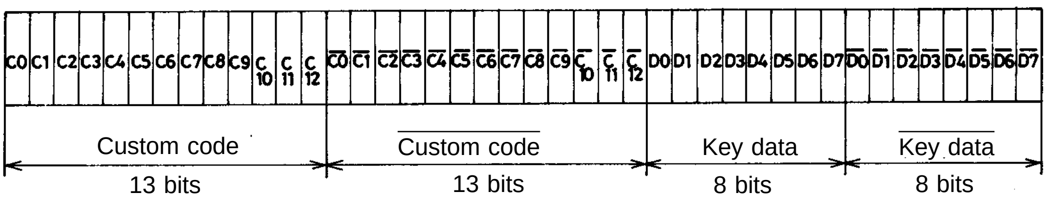
   To minimize power dissipation, the oscillator stops oscillating except when key operation is performed.

2. Key entry
   Key entry pins K_I0 to K_I3 and timing signal output pins K_O0 to K_O7 provide a key matrix of $4 \times 8 = 32$.



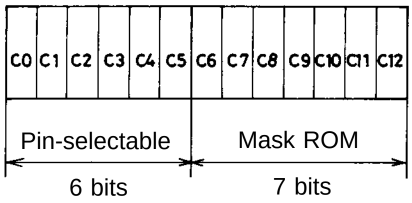
   Multi-press of key No. 20 and one of key No. 21, 22, 23 may be done, with no priority given in key entry. When the two keys are kept pressed, a series of pulses will be output according to each key entry. If multi-press of keys which are not allowed multi-press is done, no output will be delivered.

3. Data organization
   Data consists of 42 bits in all: 13 bits of custom code, 8 bits of key data, and their inverted codes.

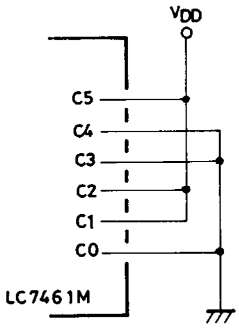


(a) Custom code

The custom code, which consists of 13 bits (C_0 to C_{12}) in all, is used to distinguish between receiving sets.



C_6 to C_{12} are fixed by the mask ROM and C_0 to C_5 are pin-settable.



In this example C_0 to C_5 are set as follows:

C_0	C_1	C_2	C_3	C_4	C_5
0	1	1	0	0	1

The custom codes are controlled by Sanyo to avoid duplication.

(b) Key data

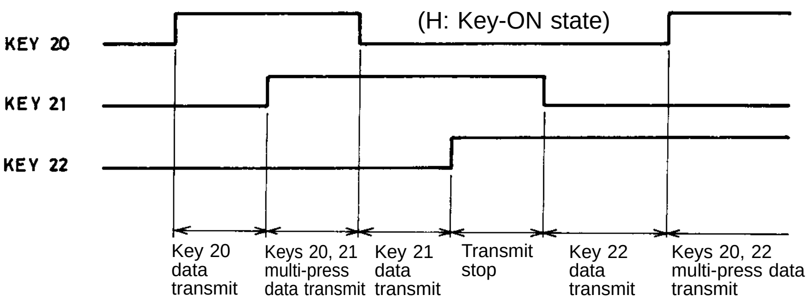
KEY No.	D_0	D_1	D_2	D_3	D_4	D_5	D_6	D_7
0	0	0	0	0	0	0	0	0
1	1	0	0	0	0	0	0	0
2	0	1	0	0	0	0	0	0
3	1	1	0	0	0	0	0	0
4	0	0	1	0	0	0	0	0
5 ⋮ 28	1 ⋮ 0	0 ⋮ 0	1 ⋮ 1	0 ⋮ 1	0 ⋮ 1	0 ⋮ 0	0 ⋮ 0	0 ⋮ 0
29	1	0	1	1	1	0	0	0
30	0	1	1	1	1	0	0	0
31	1	1	1	1	1	0	0	0

Multi-press

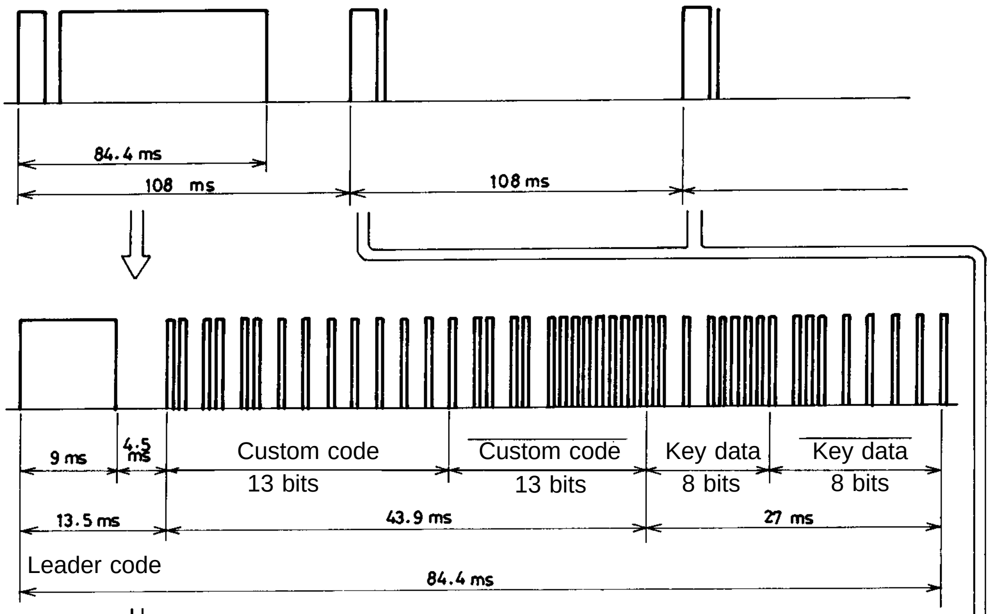
KEY No.	D_0	D_1	D_2	D_3	D_4	D_5	D_6	D_7
20, 21	1	0	1	0	1	1	0	0
20, 22	0	1	1	0	1	1	0	0
20, 23	1	1	1	0	1	1	0	0

- D_6, D_7 may be preset to “0”,“1” beforehand (mask option).

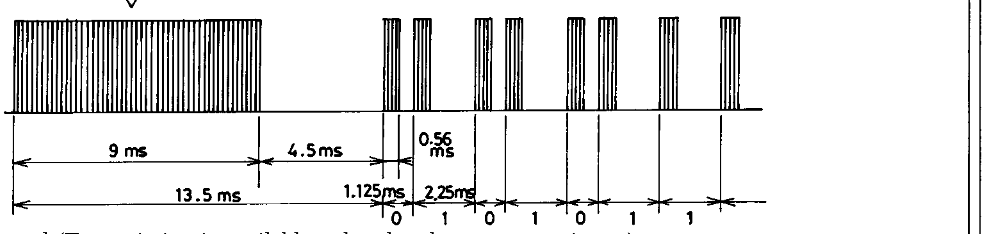
When multi-press of key No.20 and one of key No.21, 22, 23 is done, multi-bit D_5 will be set to “1”, with no priority given in key entry.



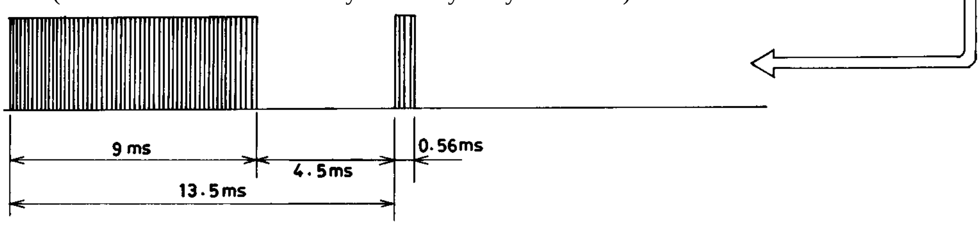
4. Transmit waveforms
   The period of time shown below is for f_{OSC} = 455 kHz.



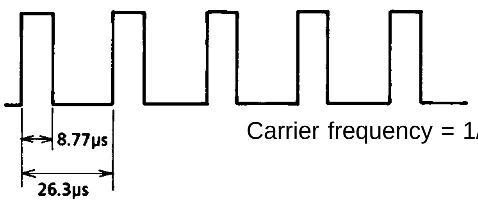
• First time



• Second time onward (Transmission is available only when key entry continues.)

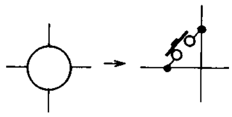


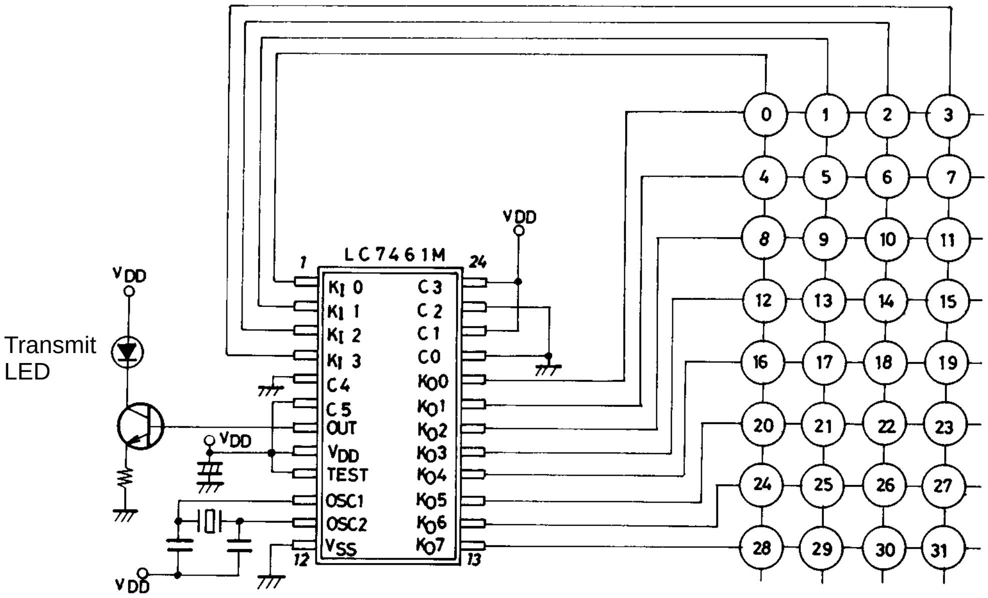
• Carrier waveform



Carrier frequency = 1/12 f_{OSC} ≑ 38 kHz

Sample Application Circuit





In this example custom code C_0 to C_5 is $C_0 \cdot\cdot\cdot\cdot\cdot C_5$.
0 1 0 1 0 1

This catalog provides information as of October, 1996. Specifications and information herein are subject to change without notice.